

WHAT IS CLAIMED IS:

1. A patient monitoring system comprising:
  - a plurality of inputs, the plurality of inputs being configured to be coupled to a plurality of electrodes including first, second and third electrodes;
  - 5 a processing circuit coupled to the plurality of inputs, the processing circuit being configured to process signals from the plurality of electrodes to produce a respiration parameter for a patient, the processing circuit having a first mode of operation in which the processing circuit produces the respiration parameter by measuring impedance between the first and second electrodes and uses the third electrode to eliminate or reduce a common mode voltage present in the signals obtained from the first and second electrodes, and the processing circuit having a second mode of operation in which the processing circuit produces the respiration parameter by measuring impedance between the third electrode and an additional one of the plurality of electrodes.
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- 15 2. The system of claim 1, wherein the third electrode is connected to the processing circuit by the RL leadwire
3. The system of claim 1, wherein the processing circuit is capable of operating in the first and second modes of operation simultaneously.
- 20 4. The system of claim 1, wherein the additional one of the plurality of electrodes is one of the first and second electrodes.
5. The system of claim 1, wherein the respiration parameter is respiration rate.
- 25 6. The system of claim 1, wherein the first and second electrodes are attached to a human having a abdomen and at least one lung and further wherein the first electrode and second electrodes are attached to the human such that a straight line extending from the first electrode to the second electrode passes through a lower portion of the lungs adjacent to the abdomen.

7. The system of claim 6, wherein the straight line substantially avoids passing through an aorta, heart, neck, or any shoulder of the patient.

8. The system of claim 6, wherein the first electrode is attached to at least a right or left leg.

5 9. The system of claim 8, wherein the first electrode is attached to the left leg at a LL location or to the right leg at a RL location.

10 10. The system of claim 6, wherein the second electrode is attached to an opposite side of abdomen as the first electrode and further wherein the second electrode is located below an armpit.

10 11. The system of claim 1, wherein the second electrode is attached to an electrode location selected from the group consisting of the V5R, HV5R, V6R, HV6R, V5, HV5, V6, and HV6 electrode locations.

15 12. The system of claim 11, wherein the second electrode is attached to an electrode location selected from the group consisting of the V5R V6R, HV5R and HV6R electrode locations.

13. An apparatus for monitoring the respiration rate of a human having a thorax and at least one lung, the apparatus comprising:

a first input configured to be connected to a first electrode attached to the thorax;

20 a second input configured to be connected to a second electrode attached to an opposite side of the thorax as the first electrode, and such that a conductive path extends through a lower portion of the lungs between the first and second inputs;

a third input configured to be connected to a third electrode, the third electrode being a RL electrode that is configured to eliminate or reduce a common mode voltage present in signals obtained from the first and second electrodes; and

25 a processing circuit configured to detect fluctuations in impedance in the conductive path, and derive a respiration signal at least from the fluctuations.

14. The apparatus of claim 13, wherein the processing circuit is also an ECG monitoring circuit that is configured to use a signal from the third electrode as a voltage reference signal in the ECG monitoring circuit.

5 15. The apparatus of claim 13, wherein the processing circuit is configured to be coupled to the first electrode to at least a right or a left leg.

16. The apparatus of claim 15, wherein the processing circuit is configured to be coupled to the first electrode at the LL location or to the right leg at the RL location.

10 17. The apparatus of claim 13, wherein the processing circuit is configured to be coupled to the second electrode at the opposite side of thorax below the armpit.

18. The apparatus of claim 12, wherein the processing circuit is configured to be coupled to the second electrode at an electrode location selected from the group consisting of the V5R, HV5R, V6R, HV6R, V5, HV5, V6, and HV6 electrode locations.

15 19. The apparatus of claim 18, wherein the processing circuit is configured to be coupled to the second electrode at an electrode location selected from the group consisting of the V5R, HV5R, V6R, and HV6R electrode locations.

20 20. The apparatus of claim 13, wherein the processing circuit includes an electronic display screen, and further wherein the processing circuit is configured to display the respiration signal on the electronic display screen as a respiration rate numeric value.

21. The apparatus of claim 20, wherein the processing circuit is configured to display the respiration signal as a trace.

25 22. The apparatus of claim 21, wherein the processing circuit is configured to display the trace on the electronic display screen.

23. A patient monitor comprising:  
a plurality of inputs, the plurality of inputs being configured to receive signals  
from electrodes attached to a patient;  
5 a processing circuit, the processing circuit being configured to process the  
signals received from the electrodes to generate a respiration parameter relating to  
respiration of the patient;  
a display, the display being configured to display respiration parameter and to  
display an indication that the respiration parameter provides a measurement of  
abdominal respiration.

10 24. A patient monitor comprising:  
an operator input device;  
a plurality of signal inputs, the plurality of signal inputs being configured to  
receive signals from electrodes attached to a patient;  
15 a processing circuit, the processing circuit being configured to process the  
signals received from the electrodes to generate a Lead I signal, a Lead II signal, and  
an abdominal respiration lead signal;  
a display, the display being configured to display options for selection by the  
operator using the operator input device, the options including an option to display a  
parameter associated with the abdominal respiration lead signal.

20 25. A method of monitoring the respiration rate of a human having an  
abdomen and at least one lung, the method comprising the steps of:  
detecting fluctuations in impedance in a conductive path between first and  
second electrodes and using a third electrode to eliminate or reduce a common mode  
voltage present in signals obtained from the first and second electrode in a first mode  
25 of operation of a processing circuit, the first electrode and second electrode being  
attached to the human such that a straight line extending from the first electrode to the  
second electrode passes through a lower portion of the lungs adjacent to the abdomen;  
detecting fluctuations in impedance in a conductive path between the third  
electrode and one of the first and second electrodes in a second mode of operation of  
30 the processing circuit; and  
deriving a respiration parameter based at least on the fluctuations.

26. A system for monitoring the respiration rate of a human having a thorax and at least one lung, the apparatus comprising:

a first means for sensing body impedance configured to be fixed to the thorax;

5 a second means for sensing body impedance configured to be fixed to an opposite side of the thorax as the first means for sensing body impedance to thereby define a conductive path extending through a lower portion of the lungs between the first and second means for sensing impedance;

10 a third means for eliminating or reducing a common mode voltage present in signals obtained from the first and second means, the third means being a RL electrode; and

a means for monitoring respiration configured to detect fluctuations in impedance in the conductive path, and to derive a respiration signal at least from said fluctuations, said monitoring means being coupled to the first and second means for sensing and coupled via the means for sensing to the human.

15 27. The system of claim 26, wherein the monitoring means is an ECG monitoring circuit that is configured to use a signal from the third means for sensing as a voltage reference signal in the ECG monitoring circuit.

28. The system of claim 27, wherein the monitoring means is configured to be coupled to the first means for sensing at a right or a left leg.

20 29. The system of Claim 28, wherein the monitoring means is configured to be coupled to the first means for sensing on the left leg at the LL location or on the right leg at the RL location.

30. The system of claim 29, wherein monitoring means is configured to be coupled to the second means for sensing on the opposite of thorax below the armpit.

25 31. The system of claim 26, wherein the monitoring means is configured to be coupled to the second means for sensing at an electrode location selected from the group consisting of the V5R, HV5R, V6R, HV6R, V5, HV5, V6, and HV6 electrode locations.

32. The system of claim 31, wherein the monitoring means is configured to be coupled to the second means for sensing at an electrode location selected from the group consisting of the V5R, HV5R, V6R, and HV6R electrode locations.

5 33. The system of claim 26, wherein the monitoring means includes an electronic display screen, and further wherein the monitoring means is configured to display the respiration signal on the electronic display screen as a respiration rate numeric value.

34. The system of claim 33, wherein the monitoring means is configured to display the respiration signal as a trace.

10 35. The system of claim 34, wherein the monitoring means is configured to display the trace on the electronic display screen.

15 36. The system of claim 26 further comprising a hospital information system, and wherein the monitoring means is coupled to the hospital information system to make information derived from the respiration signal available on the hospital information system.